SPECIFICATION

(CIP)

TITLE OF THE INVENTION:

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Invention: Burglar Alarm

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CONTINUATION IN PART (PIC) OF:

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FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT:

Not applicable.

MICROFICHE APPENDIX:

Not applicable.

BACKGROUND OF THE INVENTION:

The importance of the protection of electronic / electrical devices from being stolen are emphasized since many such a valuable devices are used in hospitals, schools, and laboratories. Various alarm apparatus systems are invented and produced to fulfil the necessity arisen from the experiences that those expensive devices have been lost. There are many different ways to activate an alarm system by using different type of sensors or radio communication devices. Sensors have their inherent lapse in adjusting their sensitivity. If a sensor is adjusted too sensitive, it may cause false alarm while if it is adjusted too loosely, it may miss a triggering of the alarm. Some alarm systems use a motion detector as an alarming initiator. The installation of the detector itself requires a quite of work.

As of U.S. Pat. No. 5,767,771, unplugging a power cord from a outlet arms an alarm system. Lamont's system is actually activated by a motion sensor

or a tempering switch like so many other alarm systems. When the main switch is turned off, the alarm circuit is on the stand by state, and unplugging the power cord does not affect the alarm circuit operation at all. The present system is actually activated by unplugging the power cord irrespective to the state of the main switch. The two systems, present invention and Lamont's system, are quite different functionally and in physical structure. Present invention and so many other systems are armed by simply turning power switch on. Lamont's system does not have a mechanism to turn the alarm off, once it is activated. My system will be turned off automatically after the predetermined period of time set by the timer circuit (34). The comparator circuit in this invention detects whether the power cord is plugged or unplugged, once it detects the disconnection of AC plug, it triggers timer circuit and activates the alarm. Alarming duration is determined by the RC timer circuit. In U.S. Pat. # 4,736,195, McMurtry used comparator circuit. However, he used very complicated associated circuit that requires much more difficult design criteria. As of McMurtry system, as long as the main switch (320) is on, the alarm system is not working. The system also requires an AC signal generator, frequency divider, switch circuit. Designing those circuits must go through lots of trial and error process. If the diode (323) is a typical diode structure, it's forward

voltage drop is 0.7 volts. The collector of the transistor (308) does not have much room for the voltage change (or to 0.7 v). It looks simple but hard to set appropriate voltage level without false triggering, especially when AC is superimposed on the DC level.

The arrow headed side of power switch (320) is connected to the power transformer, which is connected in parallel with the appliance circuit. That is why if the switch (320) is closed, the alarm system does not work. Alarm will be on when the flip-flop (324) is on state. However, the alarm must be turned off manually. In the situation where nobody is attended, the alarm will go on long time by consuming battery power. My system does not have those problems. The timer circuit controls the duration of the alarming. As the solution of all the aforementioned shortcomings of an alarm device, the present invention utilizes the method of unplugging power cord for activating an alarm system as explained in the summary part and in the detailed description section.

SUMMARY OF THE INVENTION:

The present invention is regarding to a burglar alarm means which will be activated by unplugging the power cord connected to an alarm means and an electronic / electrical device in parallel. A comparator circuit is

checking the state of the power cord connection constantly. When the cord is unplugged or broken, it will generate a right polarity of output to said alarm apparatus. The inverter circuit inverts the comparator output to the opposite polarity that is the negative going pulse and trigger the next stage, timer circuit. Timer circuit is responsible to control the time length how long the alarm will be turned on. The power amplifier amplifies the output current to provide enough power to drive the sound device. The novel feature of this invention is the way activating an alarm device which is securely fastened or attached to an electronic / electrical apparatus. If a person try to move an electronic device from one location to another location, one should unplug the power cord from a power cord outlet. This will also disconnect the AC power from the alarm device and activate it because when the electronic device is unplugged, the alarm is also unplugged. This method is quite different from the most other features such as motion sensor, infrared sensor, or shock sensor. Those sensing devices are very critical to adjust the sensitivity. This invention's method to initiate an alarm condition is very straightforward, plugged or unplugged no gray area. The sound device can be a speaker, buzzer, horn, chime, or any other noise generating apparatus. This invention will provide an alarm system which is economical to manufacture, easy to use and install, and versatile in

it's function. The inverter stage can be eliminated by redesigning the comparator circuit with the output polarity of high level during quiescent state. But this will draw more quiescent current wasting power while it is inactive. A battery- powered device can not afford wasting power while the system is not active. One simple additional transistor circuit will be well worth compensating the power loss during quiescent state of the system.

BRIEF DESCRIPTION OF THE DRAWINGS:

Fig. 1 is a detailed schematic of the present invention.

Fig. 2 is an exploded power outlet assembly, alarm devices, and electronic / electrical device connection diagram.

Fig. 3 is showing how a power cords are connected to an electronic / electrical device and to an alarm apparatus of this invention.

Fig. 4 is showing that said alarm device is mounted inside the housing (case) of said electronic device.

Fig. 5 is illustrating that said alarm circuit is included on the Printed Circuit Board of said electronic device.

Fig. 6 is a block diagram of another embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT:

Referring to Fig. 1, it illustrates the schematic diagram showing in components level for the present invention of an alarm system designed to protect an electrical or an electronic apparatus from being burglarized. This circuit uses a battery (79), which provides the necessary power for the operation of the whole alarm circuit, and is charged by a battery charger (78).

All components' value should be chosen such a way it saves power consumption during quiescent state. When switch (80) is closed, the battery voltage is connected to the alarm circuit and the LED (25) is lit. The resistor (24) is current limiting resistor to protect the LED (25).

61 is AC input transformer.

62 is main switch for the electronic / electrical devices.

63, 64, 65, 66, and 67 are parallel connected power outlets.

100 is AC cord status detection circuit and alarm activating circuit. Two power outlets (63, 64) are required for protecting an electrical or electronic device, one for the device and the other one for the alarm circuit. Irrespective to the position of the main switch (62), if outlets 63 and 64 are unplugged to remove the device 70A, the comparator 27 output will be

changed to opposite state, this state change will trigger the alarm system. Item 70 is shown to illustrate that if the input circuit of a device (such as computer) is DC open or input impedance is 1 MΩ or higher, the power cord can be connected across item 63 in parallel with item 100. In another word, it requires only one outlet for both electronic device and alarm. Item 64 can be used for another device.

Outlets 65 and 66 can be used for the same purpose for another device. This arrangement can be applied as many as needed. Item 67 is used to connect a very high continuity resistor to provide a complete DC path form V+, 81, 72, 63 top side, 62A one side, down to 67, 84, 67 top side, all the way up to E point, lower side of 63, 71, 74, to the ground. This DC path circuit provides appropriate voltage drop across R74, which maintain 27 output at one level. If 63 is unplugged, the complete circuit is broken, and the voltage across 74 is either zero voltage or very low and changes the output state of 27 to opposite state which will trigger the alarm. 78 is battery charger and 79 is a battery which provides the necessary power for the alarm side circuit. 82 and 76 are voltage divider, which provides the reference voltage to the 27. Item 70 represents another device to be protected, with input DC path opened. This device can use outlet 63 in parallel with alarm circuit. Items 77, 75, and 73 are filtering capacitors, which filters 60 HZ AC components from

entering to the inputs of the comparator. 86, 85 are high frequency filtering capacitors. The main part of the comparator stage is an operational amplifier (27). The operational amplifier has 2 input terminals, (27A) and (27B). As the name implies, the comparator stage compares 2 input values, (27A) and (27B) and produces an output (27C) with a voltage either high or low level. If input at (27A) is higher than the input at (27B), the output (27C) is at high level. To meet this requirement (Low output), the input at (27B) should be higher than the input at (27A). For this condition of V (27B) > V (27A), two voltage dividers are used, the first voltage divider resistors (82) and (76) set the reference voltage on 27A. The second voltage divider sets the comparing voltage on 27B, which comprises 81, 72, 84 (or 84A,) 75, and 74. 84 or 84A can be any electronic component, which provides DC continuity for the voltage divider circuit without consuming appreciable power. Recommended resistance value is 200K Ohms or higher. If 84A is used, it will disturb existing electrical circuit.

If 84 is used, it is easy to install, but it uses one outlet. During the non activated state of the alarm device, voltage at (27C) is low level which keeps the transistor (29) cut off, not allowing any current through it. Resistor (28) is a current limiting resistor for the base terminal of the transistor (29).

(30) is a collector resistor for the inverter circuit. The coupling capacitor (31) couples a negative going pulse at the collector of the inverter to the trigger terminal of the timer chip (34). Without capacitor (31), if the power connector (63) is unplugged, timer chip is repeatedly triggered when the timer is timed out and activating the alarm again. With the capacitor in the place, the alarm is triggered just once for the period determined R.C. network for every disconnection. The coupled negative going pulse on pin #2 triggers the timer circuit. Once the timer circuit is triggered, it produces the positive pulses on the pin # 3 of the timer chip. Three resistors, (38), (37), and (36), and the capacitor (39) determine the width of the positive pulse. (37) is a potentiometer.

The width of the output pulse can be adjusted by varying the potentiometer. The time period is determined by the following formula:

T = 1.1 x (R (36) + R (37) + R (38)) C (39). For example, if C (39) = 4.7 micro farad, R (38) = 1M ohms, R (37) = 30M ohms, and R (36) = 10k ohms, the time period can be adjusted in the range of approximately 5 seconds to 150 seconds (2.5 minutes). The C (35) is a filtering capacitor that eliminates any noise signal from appearing on the pin # 5 of the chip. The noise signal may affect the timer by resetting it irregularly. Resistors, (32) and (33) are voltage divider circuit, which determine the DC voltage

level on the pin # 2. The voltage level should be kept higher than the one third of the battery voltage (11). Pin # 4 of the timer chip (34) is reset terminal. Resistor (44) and capacitor (45) make sure the timer circuit is not activated during turning power on period. The transistor circuit (41) provides the amplification of the collector current, which drives a sound generating device (43). (40) is a current limiting resistor for the base circuit of the transistor (41). The diode (42) filters the spike voltage developed on the collector of the transistor at the instant the transistor cuts off, preventing the transistor from being damaged. Sound generating device (43) can be buzzer, horn, siren, chime, or any other noise-making device.

Fig. 2 shows the connection diagram of power outlet assembly, electronic / electrical devices, and alarm apparatus.

Item 90 is a transformer winding across which AC voltage is delivered, 91A and 91B are main switches, 98 and 98A are external resistors, out of the two resistors, only one resistor is connected depending upon which place is easy and convenient to install.

An electronic device (150) and an alarm system (100) both are connected to the same power outlet (92) in parallel. In this case, the input impedance of the device is very high or open circuited as shown by items (11) and (12).

Many personal computers have this kind of features for the AC power input. The alarm system (100) is securely attached to the electronic device. Another electronic device (250) is connected to the power outlet (93) and another alarm system (200) is connected to the power outlet (94). The power-input impedance of the device is very low as shown by item 22, that is why they are using separate power outlets for the external resistor not to be shorted out. External resistor (98) is connected to the power outlet (95). It is easy to connect the resistor across a power outlet. However, it can be connected next to power switch, if so desired, or any convenient place across two power wires between main switch and any power outlet. The power outlets (96 and 97) can be used for another electronic device and an alarm system combination.

More power outlets can be added according to the necessity.

Fig. 3 shows an alarm device (1) of this invention mounted on an electronic / electrical device (3). Epoxy glue or some other type of double face adhesive strips can be used for attaching securely the alarm device to an electronic apparatus, or special case (housing) can be made with appropriate mounting bracket on it. Fig. 3 also shows the way power cords are connected. To move said electronic device (3), the cord (4) connected to

said alarm device should be unplugged or broken because said alarm (1) is securely attached to the electronic device (3). This will activate the alarm.

Fig. 4 is showing that said alarm (1) is mounted inside the housing of the electronic device (3). A split power cord (4) is directly connected to any available power outlet. Said alarm device may be mounted on an inconspicuous place inside or outside of said electrical apparatus (3).

Fig. 5 illustrates that said alarm circuit (1) is assembled on a portion of the printed circuit board (8) of said electronic device (3) during manufacturing process.

Fig. 6 is a block diagram version of another embodiment. Item (100) including item (50) represents the alarm device for this embodiment. However, item (50) can be internal or external to the alarm circuit depending upon the availability and the cost of the separate power supply unit. The comparator (13) is comparing two inputs; one from the battery DC voltage (11) and the other from the power supply (12). The output of the power supply (12) is applied to the comparator (13) and to the battery charger (10). The battery charger charges the battery voltage. Under the condition that the power cord (2) is plugged (connected to the power outlet), the following will happen: the associated voltage divider circuits are so designed that the output of the comparator is at low level. The output of the inverter stage

(14) is at high level. The timer is in inactive state and alarm is not activated. When the power cord (2) is unplugged (disconnected from the power outlet), the following will happen: the output of the compaator is at high level and the inverter output (14) is at low level creating a negative going pulse which triggers the timer circuit (15) producing a positive pulse on the output terminal of pin # 3. The pulse width is determined by the R.C. circuit. During this period of positive pulse, the alarm (17) is activated. For the power switch (18), key switch, toggle switch, slide switch, remote control with transmitter and receiver, push button, or any other type of switch can be applied. A responsible person may disable said alarm feature by turning off the switch (18).

In the broader aspects, this invention is not limited to the specific embodiment illustrated and described herein.
Those skilled in the art may make various changes and modifications without departing from the scope and spirit of the present invention.
It is the expressed intention of this invention to embrace all such changes and modifications which fall within the scope of the described claims thereby.